ANNUAL REPORT 1965

UNION

water system

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Union Local Advisory Committee.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Union Water System, OWRC Project No. 57-W-12.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water treatment.

Yours very truly,

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET
TORONTO 5

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Union Water System, OWRC Project No. 57-W-12.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

CONTENTS

UNION

water system

operated for the

TOWN OF LEAMINGTON
TOWN OF ESSEX
TOWNSHIP OF GOSFIELD NORTH
TOWNSHIP OF GOSFIELD SOUTH
TOWNSHIP OF MAIDSTONE
TOWNSHIP OF MERSEA
H. J. HEINZ COMPANY OF CANADA LIMITED

by the

ONTARIO WATER RESOURCES COMMISSION

'65 REVIEW

The total output of the Union Water System in 1965 increased by 13.2% over the 1964 water production. Significant changes in consumption occurred in all municipalities except for Essex, and the H. J. Heinz Company. It is significant to note that 1965 was the first year in which every participant exceeded their guaranteed minimum consumptions. The increased consumption in 1965 occurred even though precipitation during the growing season was very adequate. A drier season would have resulted in a much larger increase in consumption.

Raw water turbidities held relatively steady in 1965 and very satisfactory removal was maintained. Chlorine demands were down slightly.

The complete operating costs for the Union Water System for 1965 were $125,134.23 a decrease of $904.84 or 0.7% over 1964. The production cost of water over the past five years has been 7.3, 7.7, 8.2, 9.2 and 8.1 cents per 1000 gallons. The decreased unit cost in 1965 is due entirely to the increased consumption.

Due to the relatively wet season, the practice of irrigating on alternate days in the Townships of Mersea and Gosfield South has not as yet received a lengthy trial.

A course of action for expanding the Union Water System still remains uncertain as all parties concerned cannot agree on the means by which the system can expand in an orderly and equitable manner.

The Gore & Storrie report was finalized and presented during the year. The report recommended that plant capacity be doubled and that a large system of trunk watermains be constructed to serve additional areas outside the existing system. The cost was estimated at $6,175,000 to cover expansions up to 1983.

OWRC head office technicians spent 58 1/2 manhours inspecting and reporting on the routine mechanical and electrical maintenance carried out by the plant staff.

GLOSSARY

BTU	British Thermal Unit
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpm	gallons per minute
lin. ft.	linear feet
mgd	million gallons per day
pH	a symbol for hydrogen-ion concentration; a pH test determines the intensity of the acidity or alkalinity of a water
ppm	parts per million
ss	suspended solids
SWD	side wall depth
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)
turbidity	a measurement of the amount of visible material in suspension in water

HISTORY
1956 - 1965

INCEPTION

In 1956, the Towns of Leamington and Essex and the Townships of Gosfield North, Gosfield South, Mersea and Maidstone together with the H. J. Heinz Company of Canada Ltd. and the Ontario Water Resources Commission initiated plans for a modern water treatment plant and an area distribution system.

The firm of C. G. Russell Armstrong, Consulting Engineers, Windsor, Ontario was retained to formulate plans for the project.

APPROVAL

The above participants signed an agreement with the Ontario Water Resources Commission in 1957 to finance, construct, maintain and operate the proposed system.

CONSTRUCTION

Construction commenced in 1958 -

Canadian Dredge and Dock - Toronto, Ontario - constructed a water intake and the low lift pumping station.

Schwenger Construction Ltd. - Hamilton, Ontario - constructed the water treatment plant.

W. Fullerton Construction Co. Ltd. - Windsor, Ontario and Sartori and Son Ltd. - Windsor, Ontario -constructed distribution and feeder water mains.

In November 1960, the Division of Plant Operations undertook the operation of the system.

TOTAL COST

$3,841,802.00 (estimated)

H. SANGER
SUPERINTENDENT

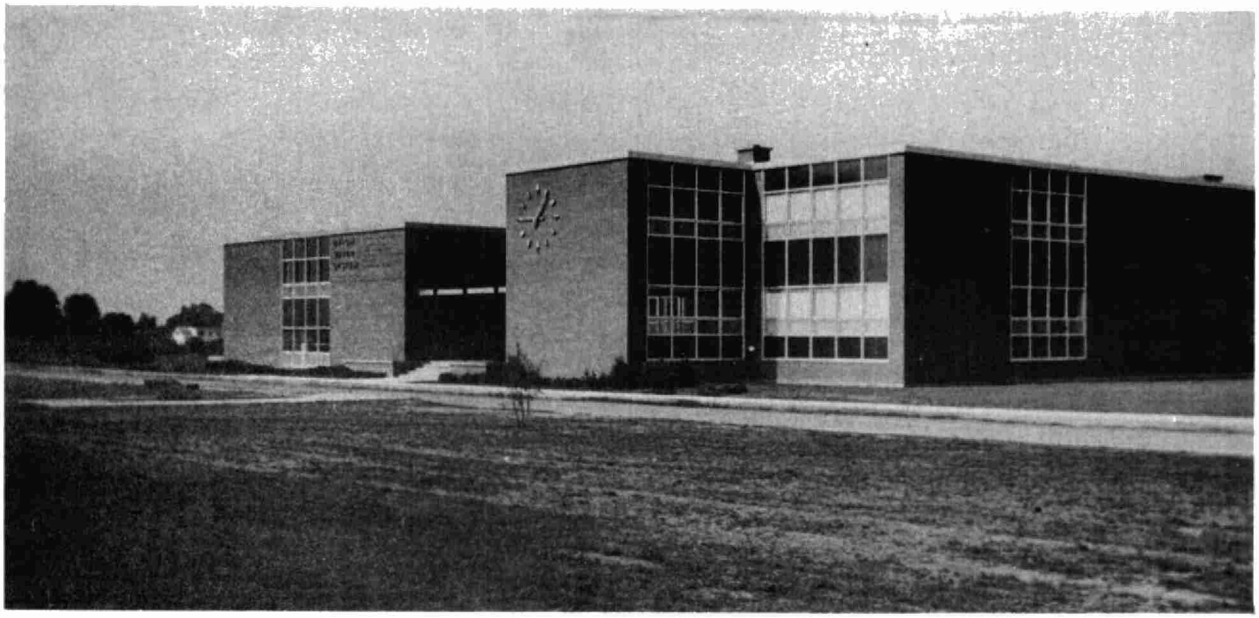
Project Staff

Mr. William Allsop	Assistant Superintendent and Plant Electrician
Mr. Gordon Campbell	Plant Mechanic
Mr. Scott Baltzer	Plant Operator
Mr. Glen Pinch	Plant Operator
Mr. David Standen	Plant Operator
Mr. Golden Stockwell	Plant Operator
Mr. Garth Tyhurst	Plant Operator
Mr. Ronald Holman	Grounds and Building Maintenance
Mr. Walter Pope	Grounds and Building Maintenance

COMMENTS

During the year the staff complement increased by one to a total of ten men. Mr. Garth Tyhurst was hired on May 17, 1965 to replace a man who had resigned on June 30, 1965. Mr. Ron Holman was hired on October 1, 1965 to bring the staff back to its proper complement. Mr. Holman had worked previous to this date as a casual labourer at the plant.

Two operators Messrs. Baltzer and Pinch attended the basic session of the OWRC course of instruction for Water Works Operators, while Messrs. Standen and Stockwell by successfully completing the above course received certification as water plant operators. Mr. Standen also attended a course in Toronto, sponsored by the OWRC, in algae identification and enumeration.



Description of Project

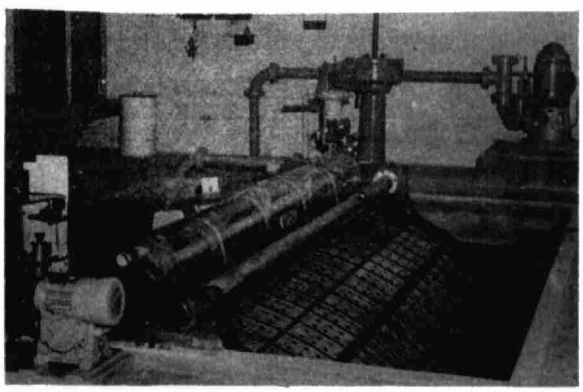
INTAKE

Water is drawn through the intake pipe to the low lift pumping station situated on the shore of Lake Erie. Solid material is excluded by a bar screen and an automatic travelling mesh screen.

LOW LIFT PUMPING STATION

At the low lift station, the screened lake water is pumped up to the treatment plant by four vertical turbine pumps. One of the pumps is provided with a standby diesel engine in case of power failure. All pumps including the diesel are automatically controlled.

Water from the low lift station is pumped up a height of 75 feet to the treatment plant between Union and Ruthven through 2,000 feet of 24 inch reinforced concrete pressure pipe.



MICROSTRAINER

MICROSTRAINER

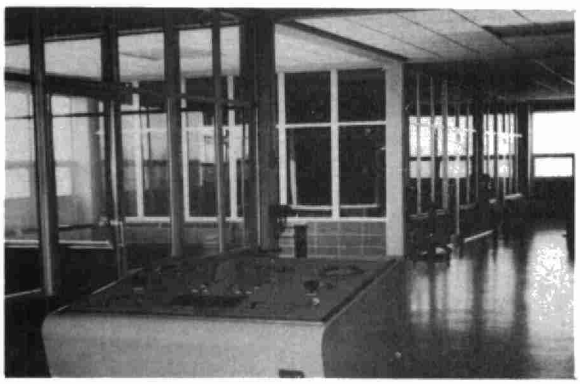
Upon reaching the treatment plant, the raw water passes through a microstrainer which is a revolving drum equipped with extremely fine woven stainless steel cloth. The microstrainer removes most of the algae and other foreign material from the raw water as it passes from the inside of the drum to the outside. The speed of the drum and the backwash water pressure are automa-

tically controlled by the water level differential across the fabric. All solids are flushed down a sewer to the lake.

CLARIFIER

After passing through the microstrainer, the finely screened water passes through a solids contact clarifier which removes most of the suspended solids and turbidity down to about three parts per million. Chemicals such as liquid alum and chlorine are added to the clarifier to coagulate the solids and improve settling. The solids settle to the bottom as a sludge and are withdrawn automatically by time clock control.

Activated carbon is sometimes added to the clarifier for taste and odour control.



FILTER CONSOLE

FILTRATION

Clarified water receives its final filtering and polishing by passing through four double type rapid sand filters which operate automatically on demand. The rapid sand filters are constructed of layers of sand and gravel which remove most of the remaining turbidity in the water as it flows down through the filter. Material trapped in the sand and gravel is backwashed out by reversing the flow of water in the filter.

DISTRIBUTION

After passing through the filters, the clear water is stored in a large underground reservoir at the plant. As water is demanded from the system, it flows from the reservoir to the high lift clear well where it receives its final chlorination before being pumped into the system by five high lift pumps. One of the pumps is provided with a standby diesel engine in case of power failure.

Treated water is pumped to Essex through a trunk main following Highway #3. A booster pumping station is located at Cottam. Ground level storage and elevated storage is provided at Essex.

Treated water is pumped to Leamington and the H. J. Heinz Company through trunk mains along Highways #3 and #18 with elevated storage being provided on Highway #3 between the plant and the Town of Leamington.

ELEVATED TANK

PROJECT COSTS

NET CAPITAL COST
(all estimated)

Essex	$ 675,619.30
Leamington	1,150,350.77
H. J. Heinz	1,494,576.23
Gosfield North	83,213.43
Gosfield South	114,139.94
Mersea	230,047.10
Maidstone	93,855.23
TOTAL	$3,841,802.00

DEBT RETIREMENT BALANCE AT CREDIT
(Sinking Fund) December 31, 1965

Essex	$ 28,318.20
Leamington	46,664.59
H. J. Heinz	61,236.51
Gosfield North	3,621 76
Gosfield South	6,467.35
Mersea	12,461.00
Maidstone	3,871.01
TOTAL	$ 162,640.42

The total cost to the municipality during 1965 was as follows:

NET OPERATING

Essex	$15,258.01	
Leamington	36,170.28	
H. J. Heinz	47,936.94	
Gosfield North	2,647.97	
Gosfield South	7,907.25	
Mersea	13,624.70	
Maidstone	1,589.08	
		$125,134.23

DEBT RETIREMENT

Essex	$12,233.11	
Leamington	20,687.07	
H. J. Heinz	27,395.16	
Gosfield North	2,087.12	
Gosfield South	4,502.39	
Mersea	8,366.20	
Maidstone	2,255.95	
		$ 77,527.00

RESERVE

Essex	$ 3,939.44	
Leamington	7,228.40	
H. J. Heinz	9,575.22	
Gosfield North	671.90	
Gosfield South	1,576.47	
Mersea	2,850.01	
Maidstone	626.56	
		$ 26,468.00

INTEREST CHARGED

Essex	$34,006.87	
Leamington	57,519.93	
H. J. Heinz	76,171.69	
Gosfield North	5,800.08	
Gosfield South	12,514.26	
Mersea	23,262.11	
Maidstone	6,276.97	
		$215,551.91
TOTAL COST		$444,681.14

Summary of Participants' Share

MONTHLY OPERATING COSTS

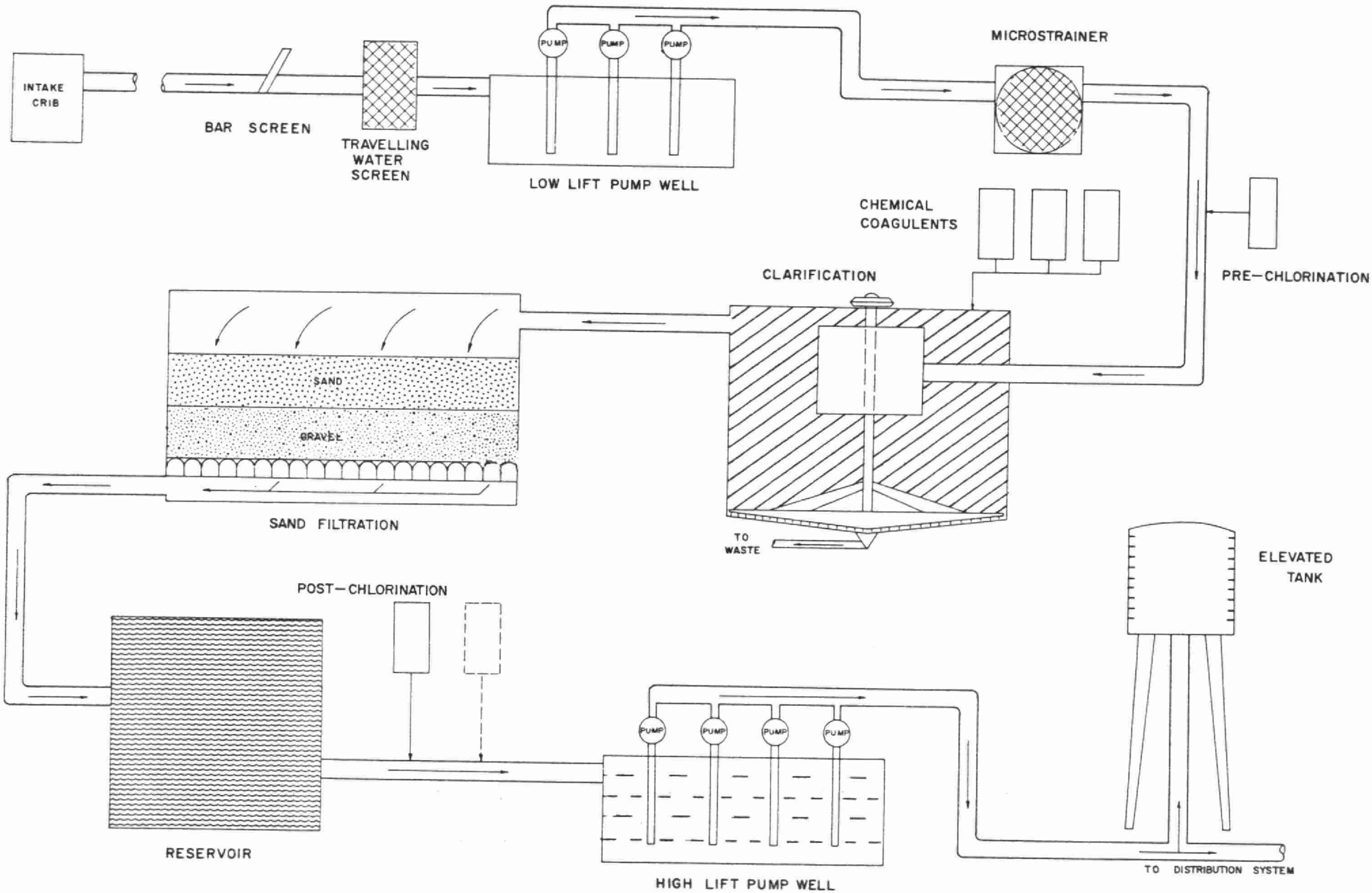
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JAN	3839.87	3452.30				45.75	189.31	20.53	44.38	87.60
FEB	7366.91	3452.30		513.30	1991.18	656.63	174.71		(0.46)	579.25
MARCH	7271.81	3452.30		458.55	1906.33	581.53	250.18		251.77	101.15
APRIL	8139.04	3870.12		573.24	1885.59	585.00	316.84		177.88	730.37
MAY	9676.05	5289.81		493.86	2057.59		437.55		918.37	478.87
JUNE	10277.77	3090.91		262.19	2436.31	556.97	111.03	19.32	3527.71	273.33
JULY	8377.16	3583.99		40.93	2689.51	1384.62	300.52		145.05	232.54
AUG	11463.49	3438.90		11.58	2734.94	917.00	235.99		147.96	3977.12
SEPT	26305.40	3462.60	299.76	13.55	2798.52	1243.78	214.90	157.59	120.15	17994.55
OCT	11313.05	5625.94		12.92	2508.79	1721.74	263.60	363.78	130.02	686.26
NOV	7231.33	4108.75		91.96	2047.46	1168.38	202.58		595.79	(983.59)
DEC	11535.31	4547.77		714.18	2078.64	1156.30	501.99	30.76	2637.09	(131.42)
TOTAL	122797.19	47375.69	299.76	3186.26	25134.86	10017.70	3199.20	591.98	8965.71	24026.03
UNION EAST	893.71									893.71
UNION WEST	1443.87				757.25			35.77	143.65	507.20

BRACKETS INDICATE CREDIT

TOTAL SYSTEM OPERATING COST: $125,134.23

Technical Section

PLANT FLOW CHART



Design-Data

Units

All capacities listed in Imperial gallons.

Intake

Fourteen hundred feet of 54 inch asbestos coated corrugated steel pipe.

Minimum depth of water above intake crib 15 feet.

Design capacity 32 MGD.

Maximum velocity at 32 MGD - 3.5 f.p.s.

Ten foot diameter steel bellmouth intake inside an 18 foot square timber crib.

Low Lift Pumping Station

One and one half x 3/8 inch coarse bar screen at 3 inch centers.

Travelling mesh screen with 1/4 inch openings having a flow through velocity of 1.8 feet per second.

Pump well 47' x 19' x 15' deep - Volume 83,500 gallons.

Pumps - Vertical Turbine

No. 1 - 1500 GPM @ 100' head - 60 HP (2 MGD approx.)

No. 2 - 3000 GPM @ 100' head - 125 HP (4 MGD approx.)

Equipped with 110 B.H.P. 6 cylinder diesel standby.

No. 3 - 3000 GPM @ 100' head - 125 HP (4 MGD approx.)

No. 4 - 1500 GPM @ 100' head - 60 HP (2 MGD approx.)

No. 5 - Provision for extra low lift pump.

Total low lift pumping capacity - 12 MGD.

Pumps operate in four steps on a two week equalizing cycle.

Treatment Plant

Microstrainer

Ten ft. long x 10 ft. diameter.

Equipped with Mark-1 fabric having maximum openings of 1/7000 inch. (35 microns).

Design capacity 7.6 MGD.

Clarifier

Ninety-four ft. diameter x 19 ft. SWD Graver Reactivator.

Design capacity 8 MGD maximum at turbidity of 600 ppm.

Volume - 823,000 gallons.

Detention time at 8 MGD - 2.5 hours.

Chemical Feeders

Two proportioning pumps each with 30 gallon per hour capacity for feeding liquid alum.

Two positive displacement volumetric dry chemical feeders for activated carbon, coagulant aids, etc.

Capacity of each 40 pounds of chemicals per hour.

pH Indicator - records pH of water between pH limits of 5.5 and 10.5.

Chlorination

Three Wallace & Tiernan V-notch chlorinators each with a capacity of 2000 lbs. per 24 hours.

Chlorination - Continued

Pre-chlorinator, post-chlorinator and standby chlorinator.

A double indication chlorine residual recorder records chlorine residual in water as it leaves the filters in the case of pre-chlorination and as it enters the distribution system in the case of post-chlorination.

Chlorine storage for six one-ton cylinders.

Weigh scale graduated to 5000 pounds.

Sand Filters

Four 18' x 36' double type filters.

Design capacity of each 2 MGD.

Design filtering rate 2.15 gallons per sq. ft. per minute.

Filters constructed of pre-cast bottom, five layers of gravel each 3 inches deep, and 27 inches of sand.

Backwash pump 4200 GPM @ 35' head - 75 HP.

Backwash rate 13 gallons per sq. ft. per minute.

Rise rate 21" per minute.

Equipped with Palmer surface jet wash facilities.

Storage Reservoir

182.5' x 122.5' x 14.8' deep. Volume 2,000,000 gallons.

Usable Volume - 1,730,000 gallons.

High Lift Pumps -Horizontal Centrifugal

No. 6 - 1800 GPM @ 200' head - 200 HP (2.6 MGD).

No. 7 - 2600 GPM @ 200' head - 200 HP (3.7 MGD).

No. 8 - 3600 GPM @ 200' head - 300 HP (5.2 MGD).

Equipped with diesel standby.

No. 9 - 7200 GPM @ 200' head - 500 HP (10.3 MGD).

No. 10 - 800 GPM @ 200' head - 60 HP (1.1 MGD).

Total high lift pumping capacity 23 MGD

Pumps are operated on a five step pressure control system.

Distribution System

Thirty inch diameter reinforced concrete pressure pipe on Hwy. No. 3 east.

Twelve inch diameter cement lined cast iron pipe on Hwy. No. 18 east.

Capacity approximately 16 MGD.
Twelve inch diameter cement lined cast iron pipe on Hwy. 3 to Cottam.

Capacity approximately 3 MGD.

Twelve inch diameter asbestos cement pipe from Cottam to Essex.

Main delivers water to 2 MGD ground storage reservoir owned by Essex P.U.C. and is pumped to a 250,000 gallon tower.

Elevated Storage

330,000 gallon 100 ft. high on Hwy. 3.

Cottam Booster Station

1,000 GPM horizontal centrifugal pump at 100' head (1.3 MGD).

Pump cuts in automatically at 40 psi and out at 50 psi.

TOTAL AREA FLOW

Month	Total Flow MGD	Avg. Max. MGD	Avg. Min. MGD	Avg. Daily MGD	Cumulative Total
January	97.694	4.684	1.296	3.151	97.694
February	90.122	5.299	1.440	3.219	187.816
March	104.348	5.846	1.440	3.366	292.164
April	106.659	6.365	1.440	3.555	398.823
May	132.713	7.752	1.344	4.281	531.536
June	176.671	10.022	1.670	5.889	708.207
July	182.407	10.627	1.728	5.884	890.614
August	171.741	10.253	2.016	5.540	1062.355
September	160.514	8.899	1.930	5.350	1222.869
October	111.081	6.959	1.776	3.583	1333.950
November	103.948	7.114	1.440	3.465	1437.898
December	101.150	6.624	1.440	3.263	1539.048
Total	1539.048				
Average	128.254	7.537	1.580	4.217	

COMMENTS

During 1965, a total of 1539.048 million gallons of water were treated at and pumped from, the plant as measured by meter No. 1. It should be noted that this reading is slightly greater than the cumulative readings of the area meters. The difference is 0.052% and is attributed mainly to meter discrepancies and line losses.

The total plant output for 1965 is up approximately 11% from 1964. The average daily flow of 4.217 million gallons represents 55.5% of plant design capacity, i.e. 7.6 MGD. The average maximum daily flow of 7.54 million gallons represents 99% of plant design capacity.

CONSUMPTION OF PARTICIPANTS

PARTICIPANT	CONSUMPTION (MG)						% OF TOTAL					
	1960	1961	1962	1963	1964	1965	1960	1961	1962	1963	1964	1965
GOSFIELD S	16.34	37.29	51.74	74.96	75.01	99.12	1.6	2.0	3.9	5.4	5.5	6.4
GOSFIELD N	9.95	13.13	21.60	29.53	23.35	30.06	0.9	1.1	1.6	2.1	1.7	1.9
MERSEA	55.70	79.85	99.51	137.71	127.96	168.68	5.3	6.5	7.4	9.8	9.4	11.0
LEAMINGTON	335.00	399.91	404.04	455.70	407.97	449.64	31.8	32.5	30.4	32.5	30.0	29.2
HEINZ	500.00	534.50	557.04	520.40	541.00	595.00	47.5	43.5	41.8	37.1	39.8	38.8
ESSEX	130.00	158.58	190.04	177.07	174.46	177.72	12.4	12.9	14.3	12.6	12.8	11.5
MAIDSTONE	5.41	6.37	8.45	7.46	9.62	18.03	0.5	0.5	0.6	0.5	0.8	1.2
TOTAL	1052.40	1229.63	1332.42	1402.83	1359.37	1538.25	100.0	100.0	100.0	100.0	100.0	100.0

COMMENTS

The most significant observation on the above data is that the consumption during 1965 of all participants, except Essex and Leamington, is the highest since the system started in 1960. It is also well to note that 1965 was a particularly good season with respect to precipitation, so that the flow increase cannot be attributed mainly to irrigation requirements in a dry season.

Participant	Agreed Annual Minimums Original	Revised	ANNUAL CONSUMPTIONS 1960	1961	1962	1963	1964	1965	Agreed Daily Maximums	1965 Peak Monthly Rate Calculated Daily
	MG	MG	MG	MG	MG	MG	MG	MG	1000 gals.	1000 gals.
H. J. Heinz	520.0	520.0	500.0	534.5	557.0	520.4	541.0	595.0	3500	2280
Leamington	426.0	400.0	335.0	399.9	404.0	455.7	408.0	449.6	2100	2120
Essex	166.0	160.0	130.0	158.6	190.0	177.1	174.5	177.7	752	890
Mersea	12.5	70.0	55.7	79.8	99.5	137.7	128.0	168.7	40	855
Gosfield S	16.5	40.0	16.3	37.3	51.8	74.9	75.0	99.1	60	624
Gosfield N	23.5	20.0	10.0	13.1	21.6	29.5	23.3	30.1	80	138
Maidstone	12.0	10.0	5.4	6.4	8.5	7.5	9.6	18.1	45	79
TOTAL	1176.5	1220.0	1052.4	1229.6	1332.4	1402.8	1359.4	1538.2	6577	6986

COMMENTS

The tabulation above shows the evolution of both agreed minimum and maximum flow requirements of each participant since the system was put into operation. It is especially significant to note the following:

a) In 1965 Mersea Township used more than twice its guaranteed minimum
b) In 1965 Gosfield South Township used more than twice its guaranteed minimum.

A comparison of the original agreed daily maximums with the average daily flow during the peak months reveals that Mersea Township and Gosfield South Township are demanding 20 times and 10 times more water in a day than they originally agreed to take.

UNION WATER SYSTEM

1965 FLOW DATA

ADJUSTED MONTHLY FLOWS BY PARTICIPANT

Flows expressed in Million Gallons (MG)

Month	Gosfield South	Mersea	Leamington	Essex	Maidstone	Gosfield North	Heinz	Total
January	2.824	5.862	26.959	10.733	1.195	1.865	47.581	97.019
February	2.465	5.116	23.527	9.366	1.043	1.628	44.809	87.954
March	4.347	11.092	23.954	10.852	1.145	1.804	49.932	103.126
April	4.210	10.743	23.200	10.511	1.109	1.747	47.974	99.494
May	17.757	24.401	42.726	13.149	1.962	2.735	49.416	152.146
June	18.704	25.704	45.008	13.852	2.066	2.880	38.513	146.727
July	14.600	25.001	65.600	27.610	2.441	3.287	36.810	175.349
August	13.293	22.817	59.911	25.159	2.226	2.997	48.128	174.531
September	5.650	9.300	37.950	14.720	1.140	3.260	68.387	140.407
October	7.177	11.866	48.165	18.714	1.449	4.141	52.013	143.525
November	3.826	7.938	24.899	10.905	1.067	1.758	56.833	107.226
December	4.263	8.844	27.741	12.150	1.188	1.958	54.604	110.748
Totals 1965	99.116	168.684	449.640	177.721	18.031	30.060	595.000	1538.252
Totals 1964	75.008	127.963	407.970	174.459	9.626	23.346	540.997	1359.369
% Diff. 65/64	+32.1%	+31.9%	+10.2%	+1.9%	+87.3%	+28.8%	+10.0%	+13.2%

COMMENTS

The chart of Adjusted Flows is merely a monthly representation of the bimonthly flow determinations as per meter readings taken by participants and the plant staff. The difference between 1965 and 1964 consumption by participant is shown on the last line.

Process Data

PLANT FLOW

Graph No. 1 shows that, while the peak monthly flow was down slightly from 1964, the total annual flow was up approximately 13 percent. Again the peak month occurred in July when 182 million gallons were pumped. This represents an average daily flow of 5.88 MG which is 77.4% of the plant capacity.

H. J. HEINZ

Graph No. 2 shows that the total annual flow was up 10% even though the annual peak was down slightly and there was very low consumption during July and August due to a strike. The peak occurred in September which is not coincident with the plant peak.

LEAMINGTON

Graph No. 3 indicates an increase in both total annual flow, 10.2% and monthly peak flow, 16%. The monthly peak again occurred in July, coincident with the plant peak.

ESSEX

Graph No. 4 shows that annual flow is up slightly. The monthly peak is also increased slightly and again occurred in July.

MERSEA

Graph No. 5 indicates that the monthly peak in 1965 was up slightly over 1966 and occurred in June. The total annual flow however increased substantially.

GOSFIELD SOUTH

Graph No. 6 shows a significant increase in both monthly peak (44%)and total annual flow(32%). The peak however, occurred in June and was off the plant peak.

GOSFIELD NORTH

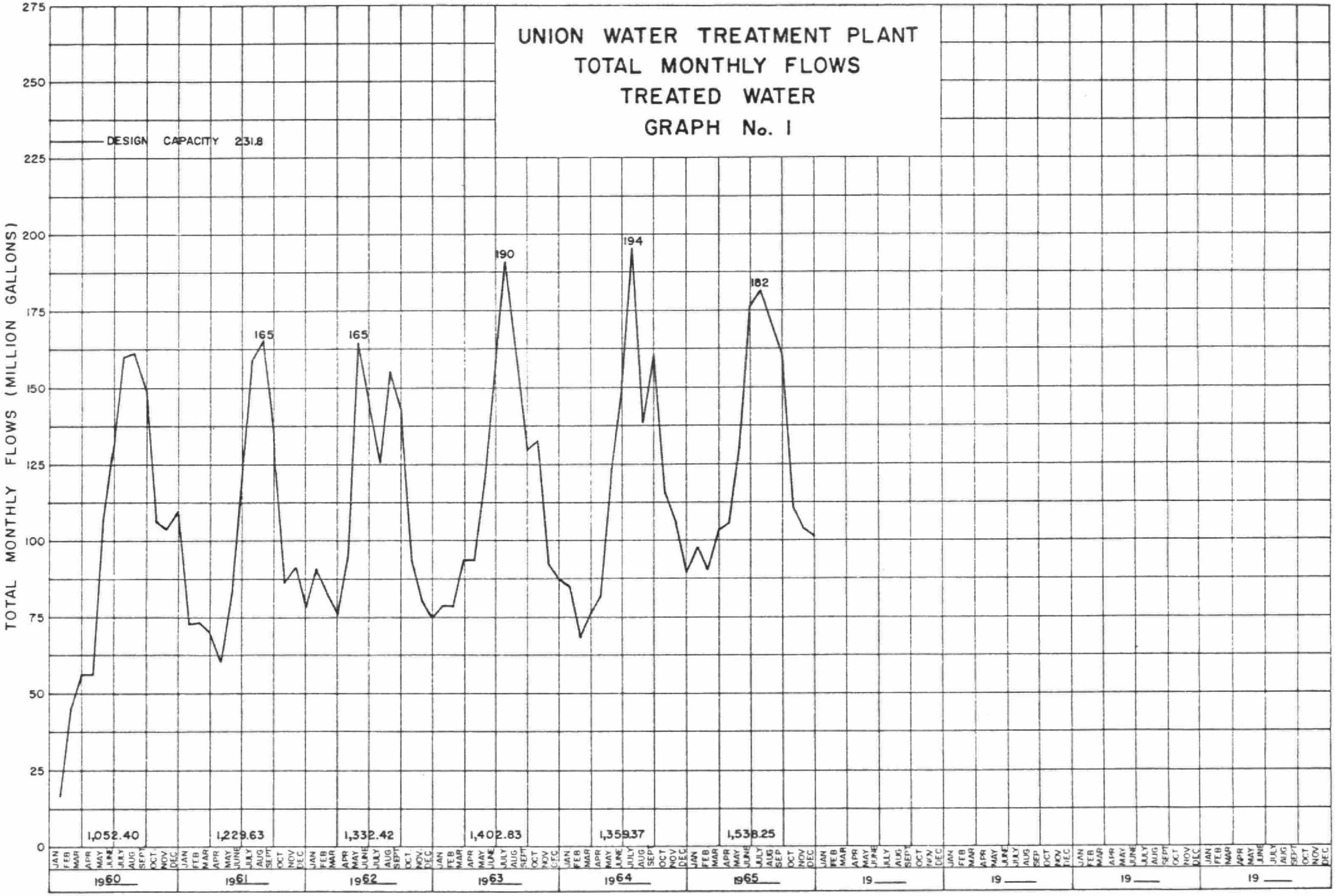
Graph No. 7 shows an increase in peak monthly flow of approximately 58% while total annual flow increased approximately 28. 8%.

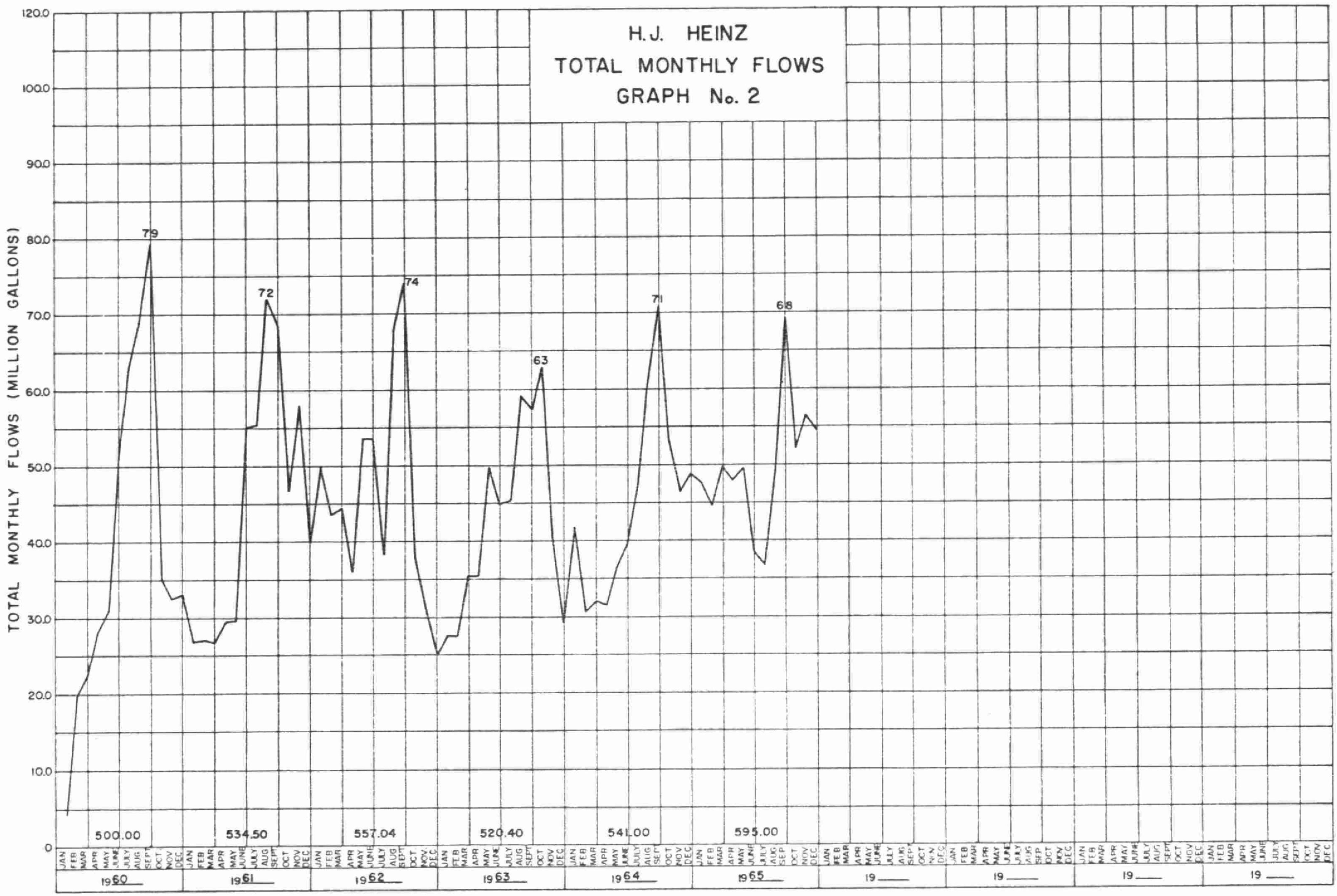
MAIDSTONE

Graph No. 8 shows an almost 100% increase in both peak monthly flow and total annual flow. This of course is caused by the addition of the Woodslee line to the system. Woodslee was connected late in 1964.

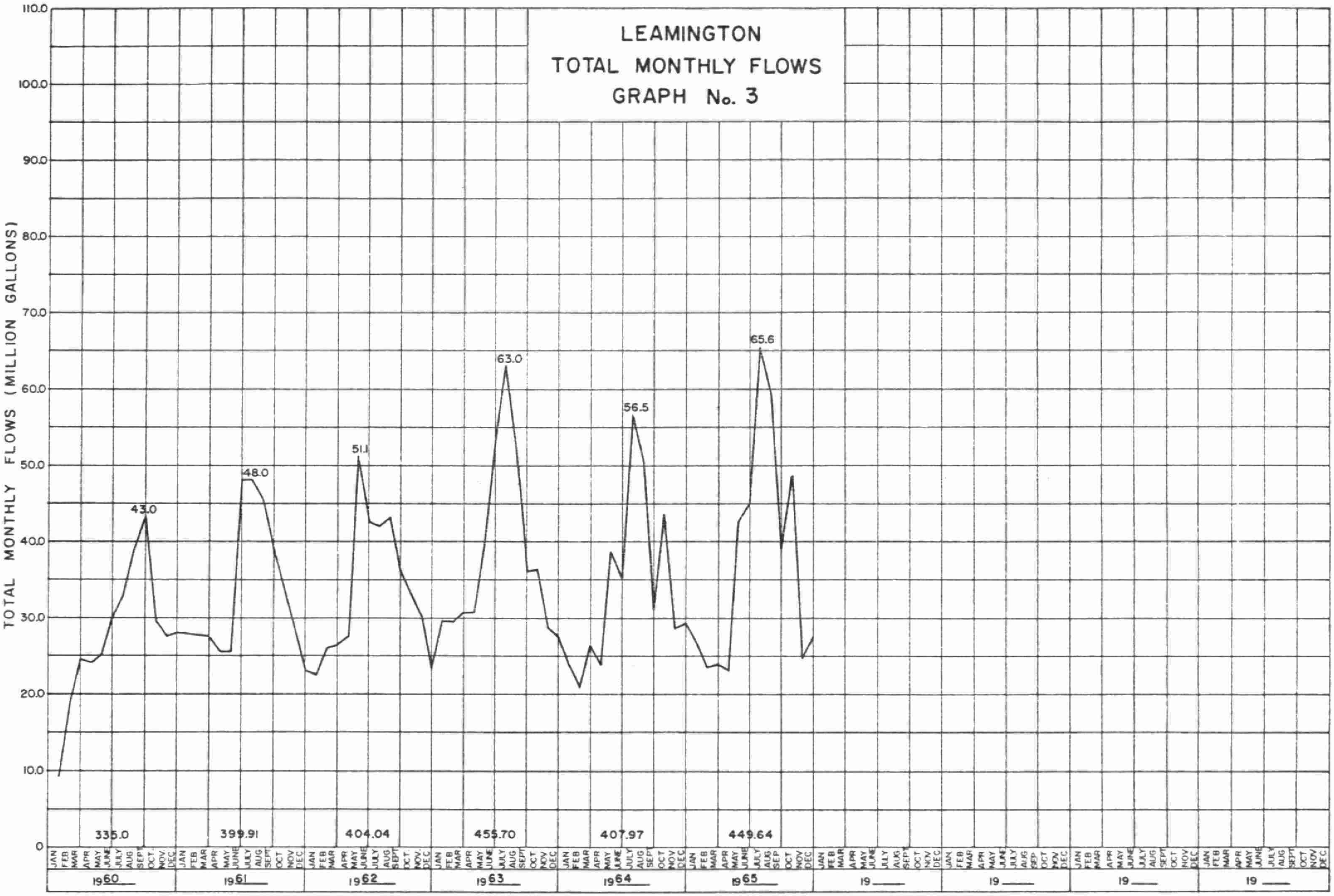
SEASONAL TURBIDITY VARIATION

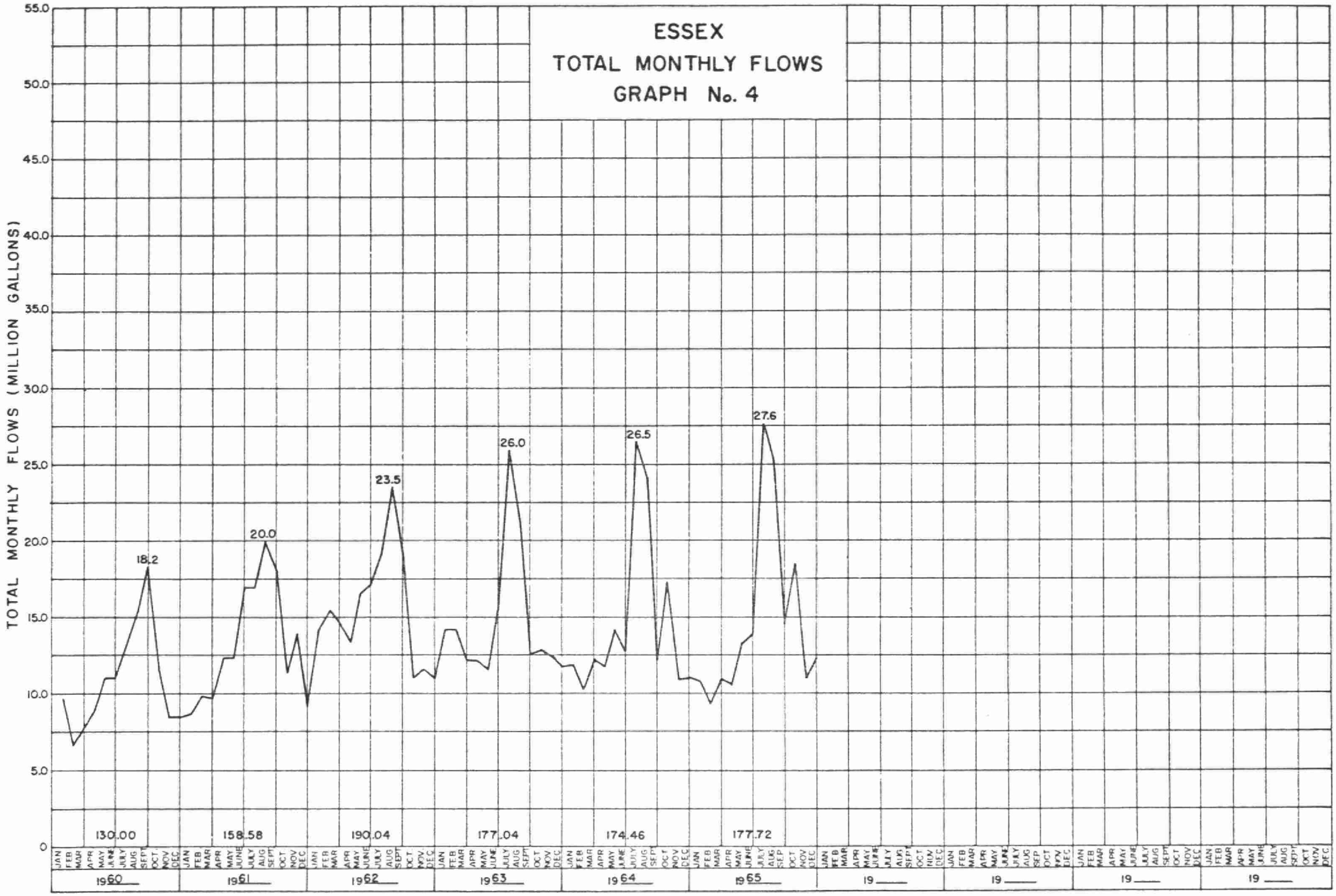
The graph of seasonal turbidity variation shows that the 1965 peak was more extreme than in the recent past. The turbidity in the clarified and filtered water remained at very satisfactory levels with the overall removal efficiency holding at better than 99%.

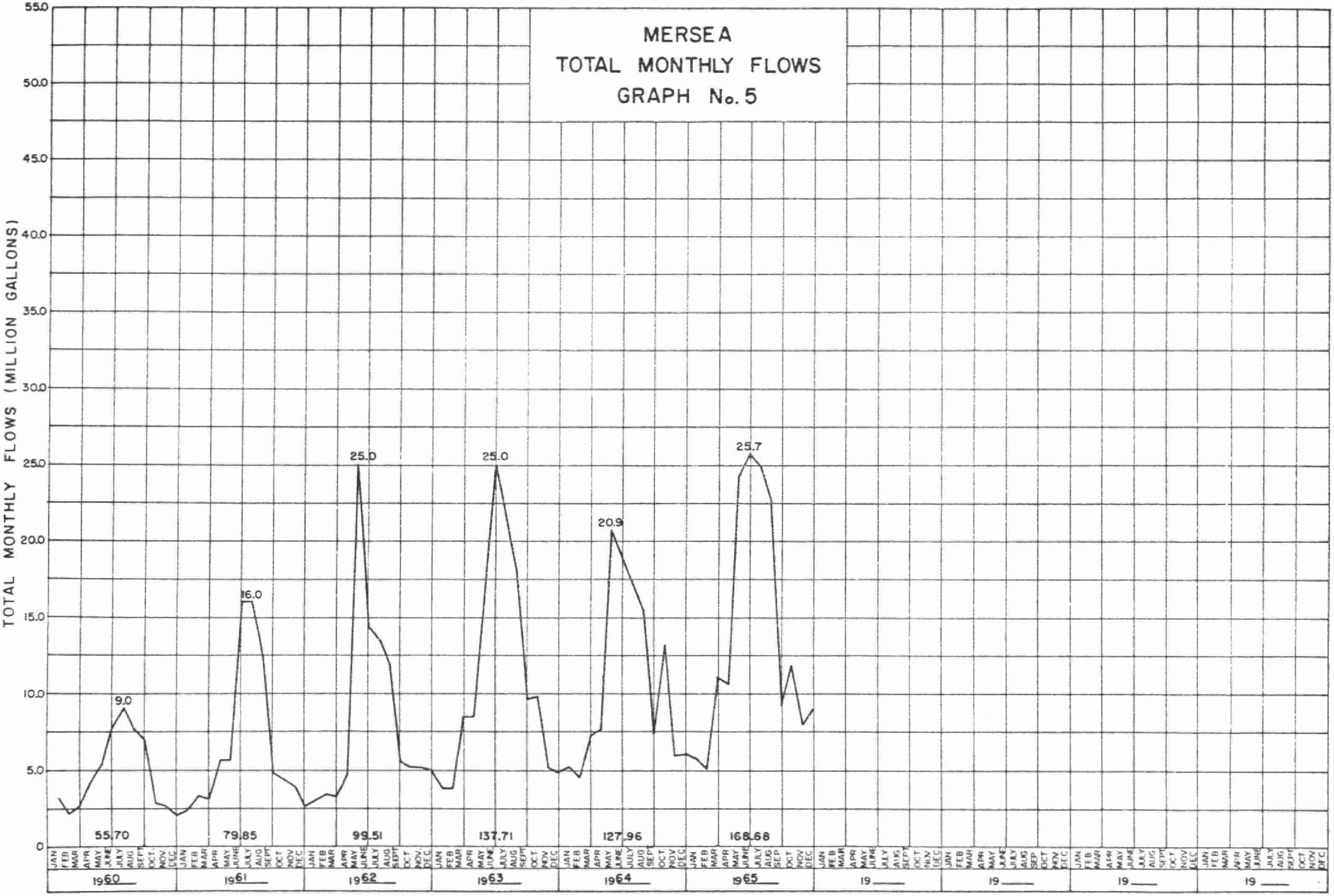

UNION WATER TREATMENT PLANT
TOTAL MONTHLY FLOWS
TREATED WATER
GRAPH No. 1
DESIGN CAPACITY 231.8
TOTAL MONTHLY FLOWS (MILLION GALLONS)
0
25
50
75
100
125
150
175
200
225
250
275
165
165
190
194
182
1,052.40
1,229.63
1,332.42
1,402.83
1,359.37
1,538.25
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
1960
1961
1962
1963
1964
1965
19

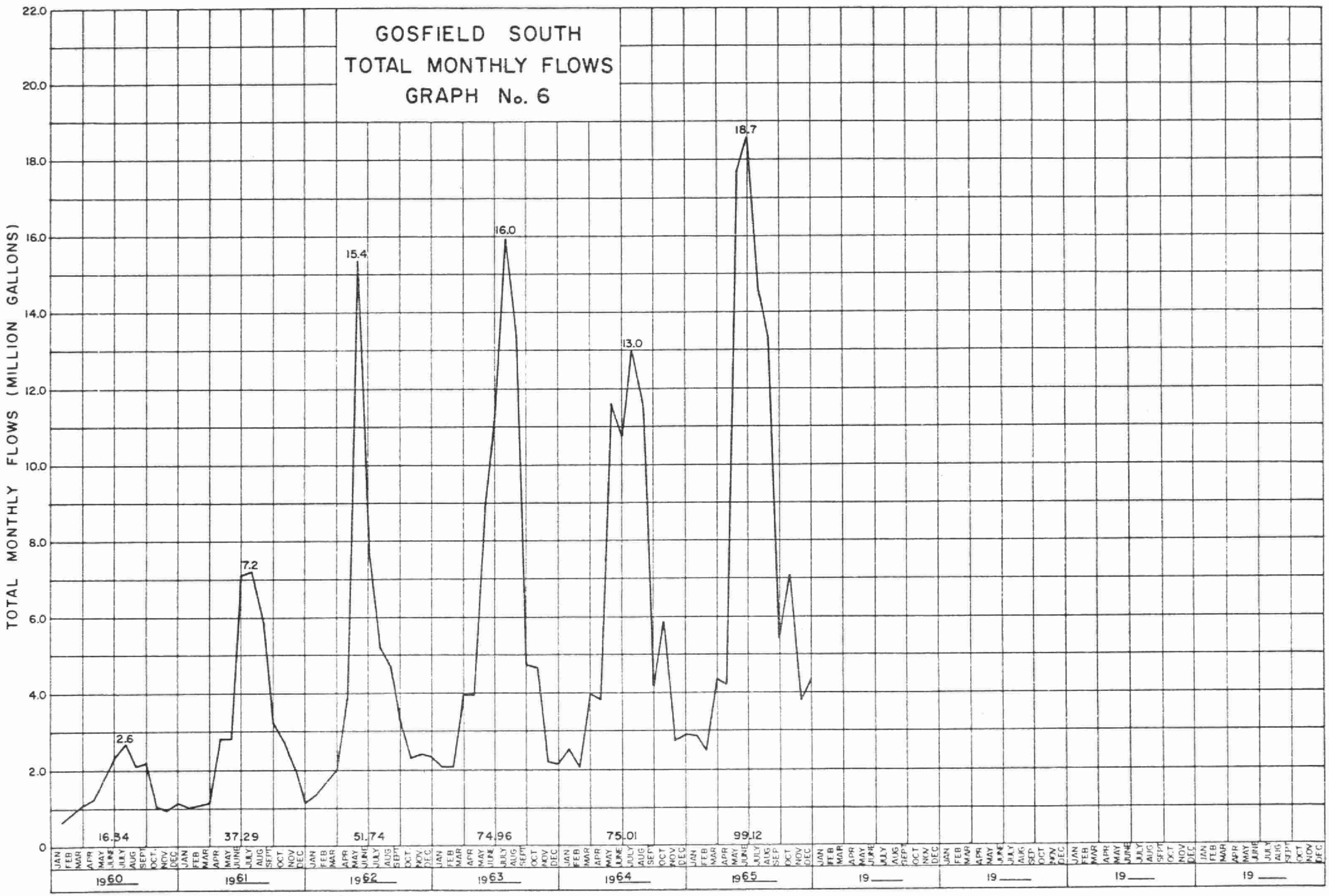


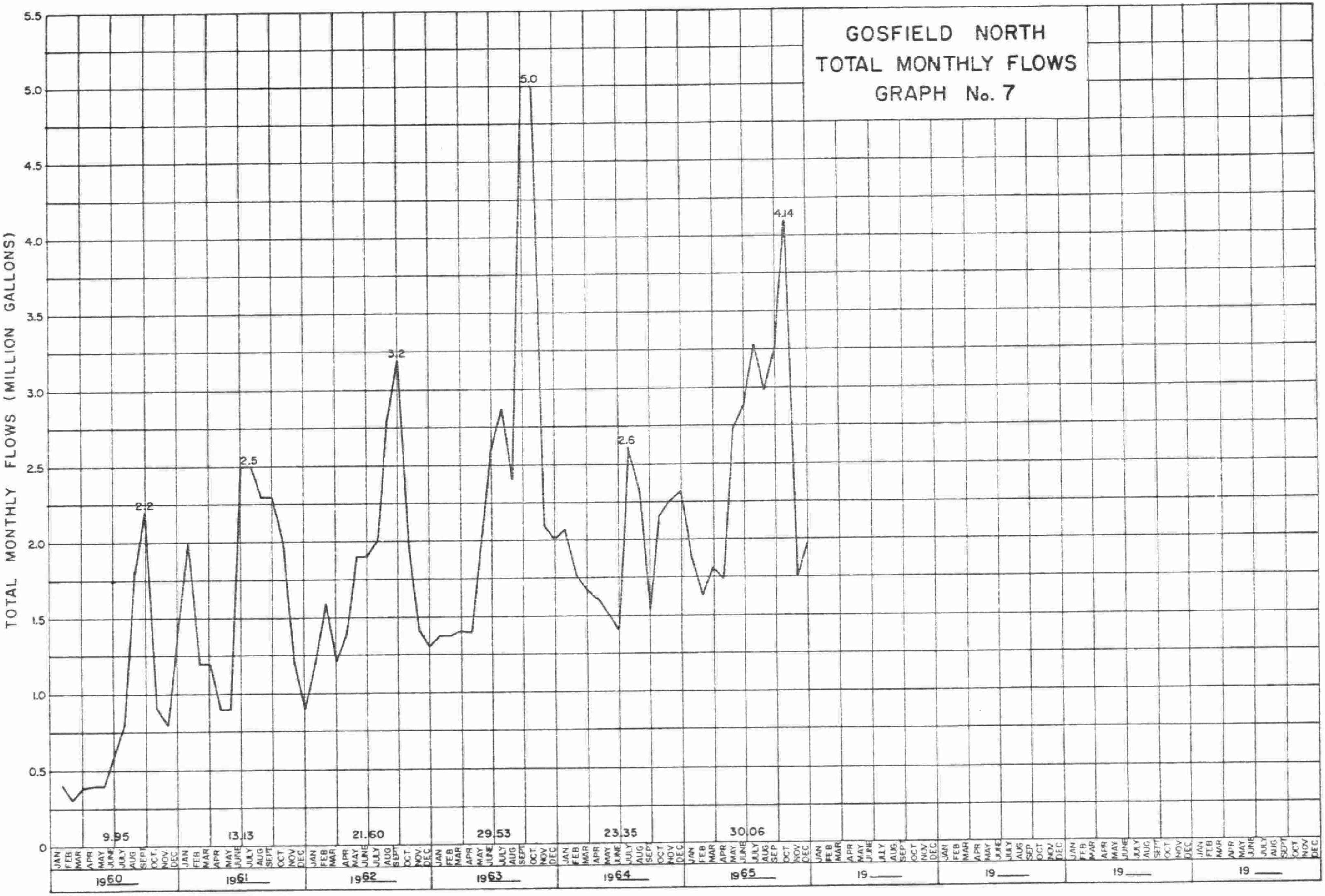
H.J. HEINZ
TOTAL MONTHLY FLOWS
GRAPH No. 2
TOTAL MONTHLY FLOWS (MILLION GALLONS)
120.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
79
72
74
63
71
68
500.00
534.50
557.04
520.40
541.00
595.00
1960
1961
1962
1963
1964
1965
19
19
19
19


LEAMINGTON
TOTAL MONTHLY FLOWS
GRAPH No. 3
TOTAL MONTHLY FLOWS (MILLION GALLONS)
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
43.0
48.0
51.1
63.0
56.5
65.6
335.0
399.91
404.04
455.70
407.97
449.64
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
1960
1961
1962
1963
1964
1965
19
19
19
19

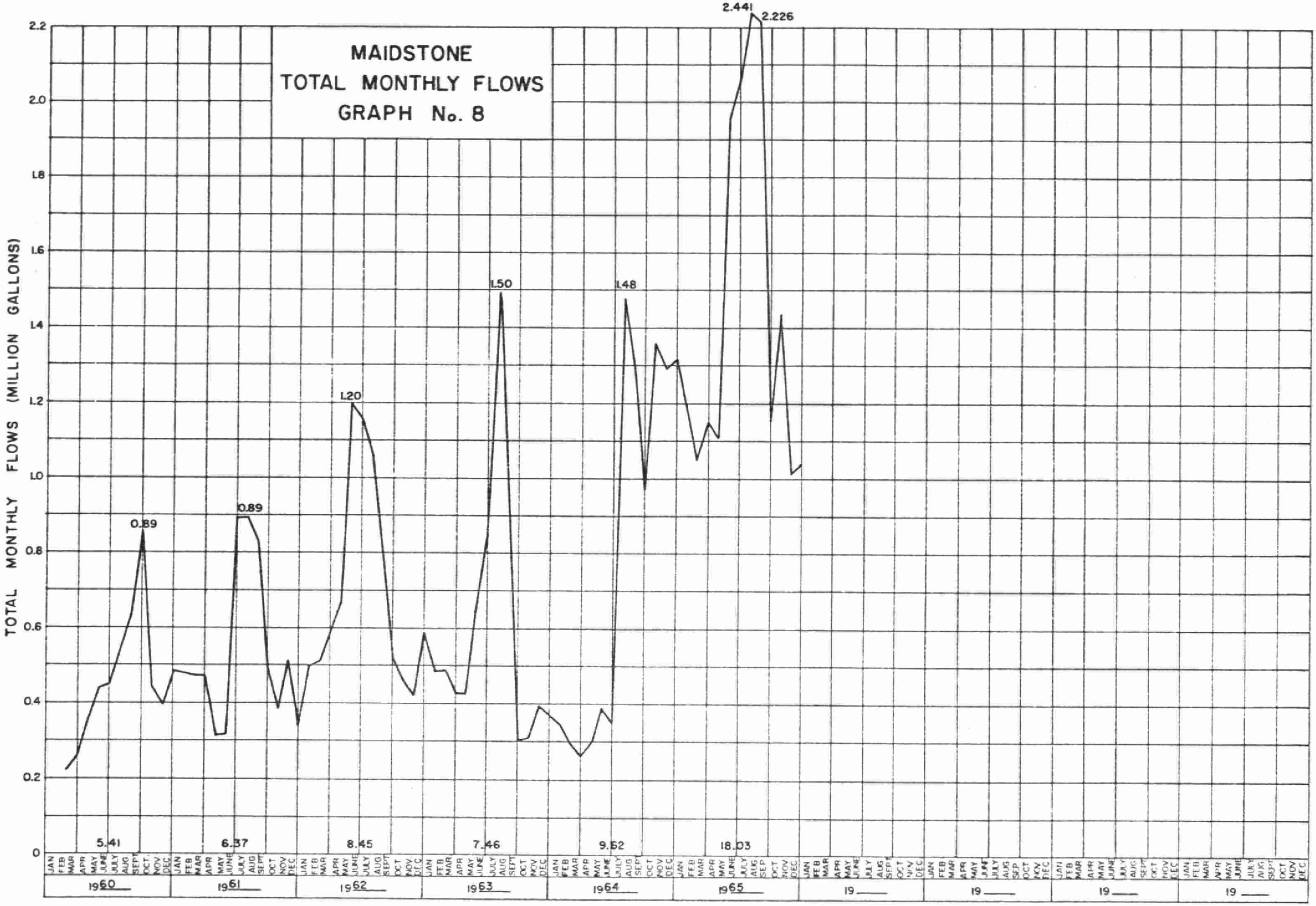

ESSEX
TOTAL MONTHLY FLOWS
GRAPH No. 4
TOTAL MONTHLY FLOWS (MILLION GALLONS)
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
18.2
20.0
23.5
26.0
26.5
27.6
130.00
158.58
190.04
177.04
174.46
177.72
1960
1961
1962
1963
1964
1965
19

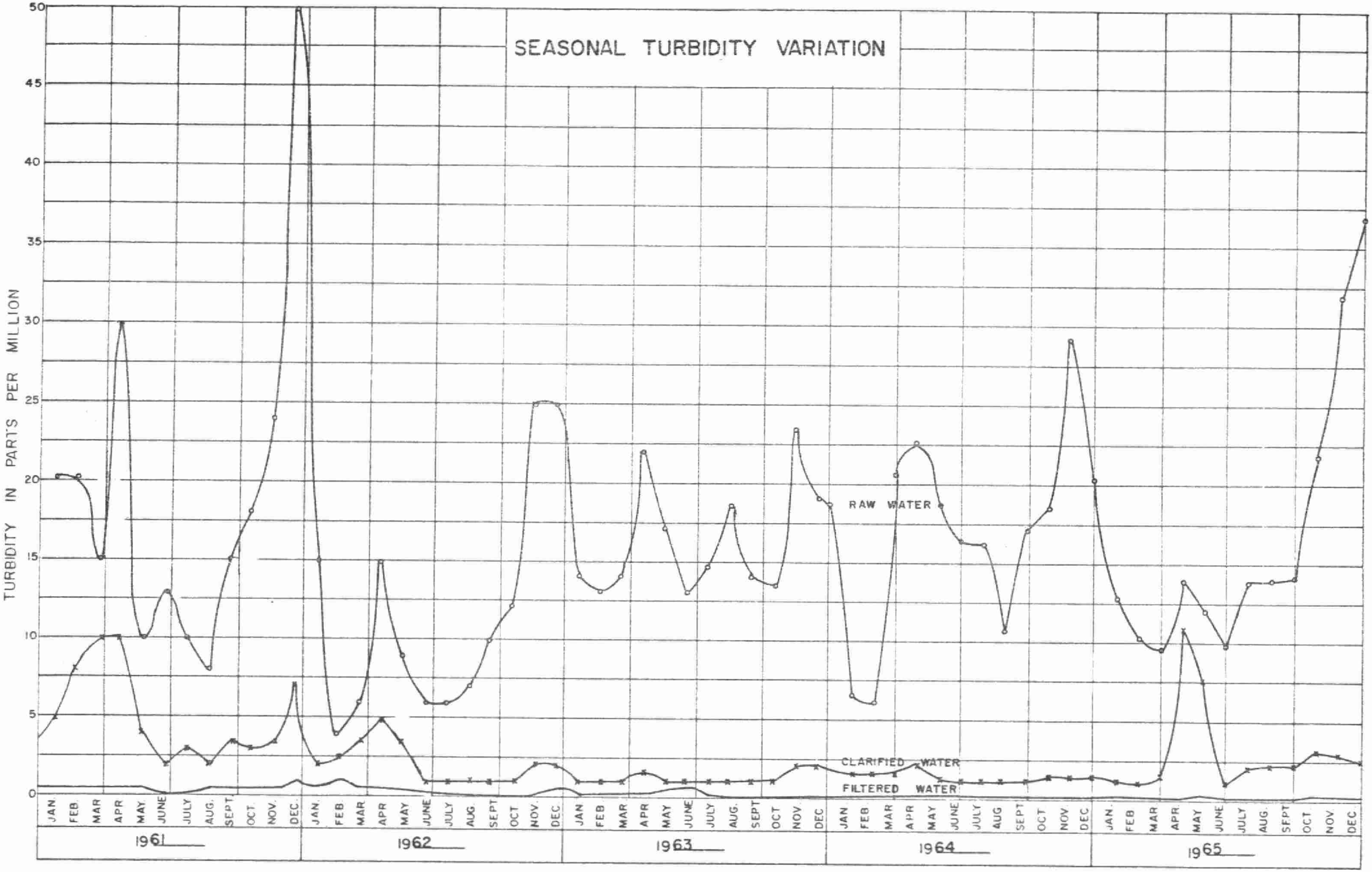

MERSEA
TOTAL MONTHLY FLOWS
GRAPH No. 5
TOTAL MONTHLY FLOWS (MILLION GALLONS)
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
9.0
16.0
25.0
25.0
20.9
25.7
55.70
79.85
99.51
137.71
127.96
168.68
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT. NOV DEC
1960
1961
1962
1963
1964
1965
19
19
19
19

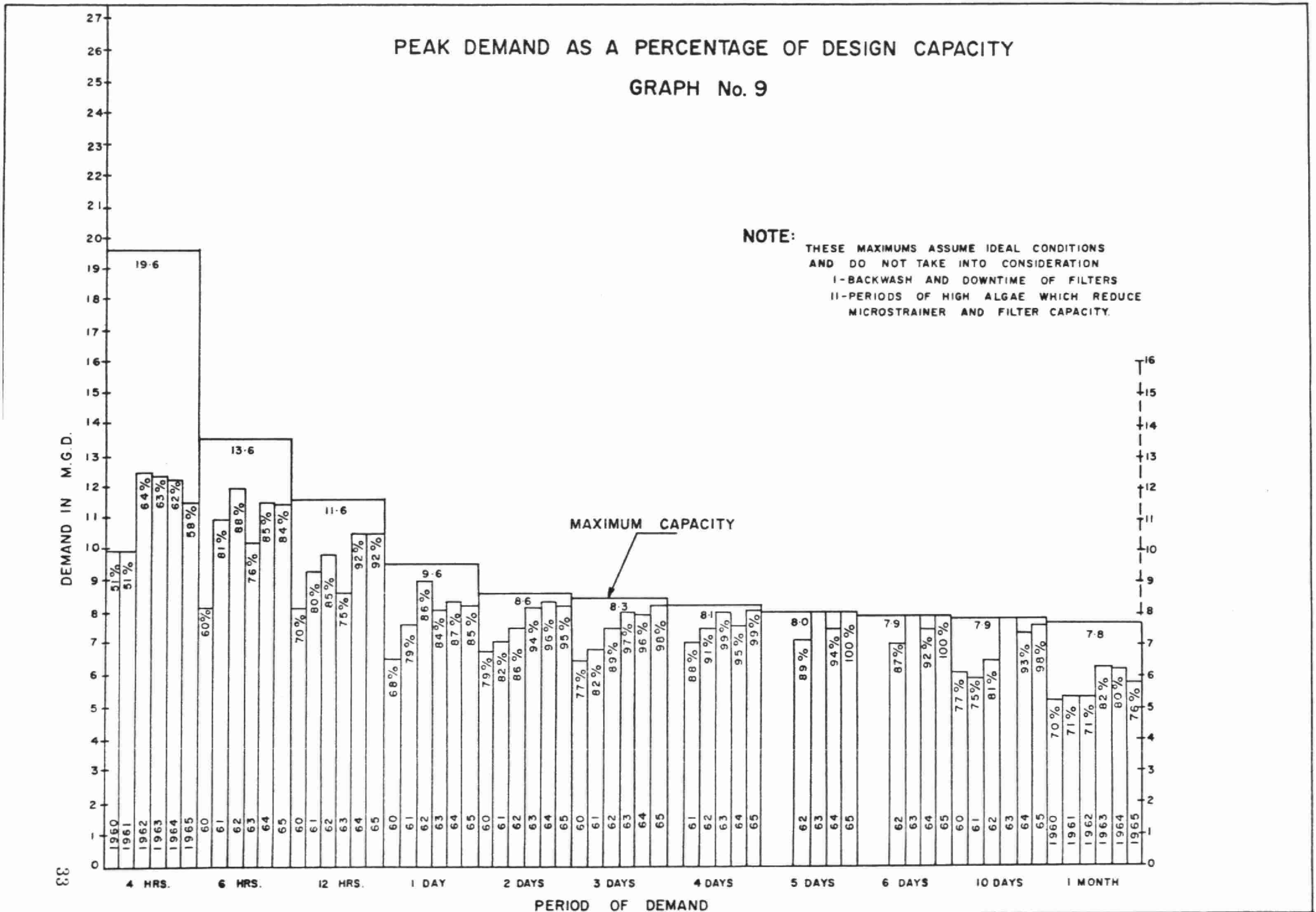

GOSFIELD SOUTH
TOTAL MONTHLY FLOWS
GRAPH No. 6
TOTAL MONTHLY FLOWS (MILLION GALLONS)
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0
2.6
7.2
15.4
16.0
13.0
18.7
16.34
37.29
51.74
74.96
75.01
99.12
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
1960
1961
1962
1963
1964
1965
19
19
19
19



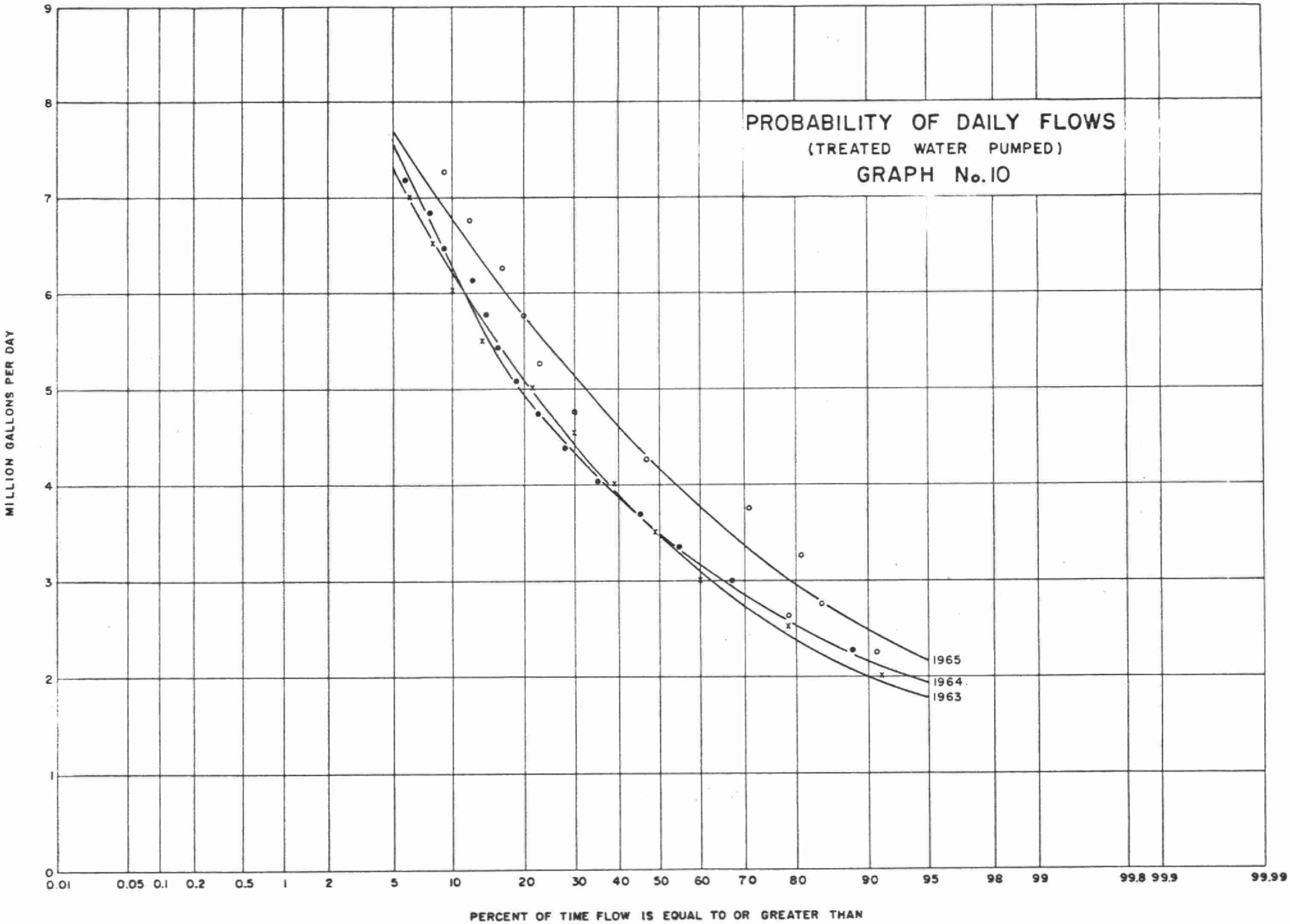
GOSFIELD NORTH
TOTAL MONTHLY FLOWS
GRAPH No. 7
TOTAL MONTHLY FLOWS (MILLION GALLONS)
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
2.2
2.5
3.2
5.0
2.6
4.14
9.95
13.13
21.60
29.53
23.35
30.06
1960
1961
1962
1963
1964
1965
19
19
19
19


MAIDSTONE
TOTAL MONTHLY FLOWS
GRAPH No. 8
TOTAL MONTHLY FLOWS (MILLION GALLONS)
0.89
0.89
1.20
1.50
1.48
2.441
2.226
5.41
6.37
8.45
7.46
9.52
18.03
1960
1961
1962
1963
1964
1965


SEASONAL TURBIDITY VARIATION
TURBIDITY IN PARTS PER MILLION
50
45
40
35
30
25
20
15
10
5
0
RAW WATER
CLARIFIED WATER
FILTERED WATER
JAN. FEB. MAR. APR. MAY. JUNE. JULY. AUG. SEPT. OCT. NOV. DEC.
1961
1962
1963
1964
1965



PEAK DEMAND AS A PERCENTAGE OF DESIGN CAPACITY
GRAPH No. 9
NOTE: THESE MAXIMUMS ASSUME IDEAL CONDITIONS AND DO NOT TAKE INTO CONSIDERATION
I-BACKWASH AND DOWNTIME OF FILTERS
II-PERIODS OF HIGH ALGAE WHICH REDUCE MICROSTRAINER AND FILTER CAPACITY.
MAXIMUM CAPACITY
DEMAND IN M.G.D.
PERIOD OF DEMAND
4 HRS.
6 HRS.
12 HRS.
1 DAY
2 DAYS
3 DAYS
4 DAYS
5 DAYS
6 DAYS
10 DAYS
1 MONTH
19·6
13·6
11·6
9·6
8·6
8·3
8·1
8·0
7·9
7·9
7·8


PROBABILITY OF DAILY FLOWS
(TREATED WATER PUMPED)
GRAPH No. 10
MILLION GALLONS PER DAY
0
1
2
3
4
5
6
7
8
9
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
1965
1964
1963
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN

		PRE-CHLORINATION		POST-CHLORINATION	
Month	Flow (MG)	Pounds Chlorine	Dosage Rate (PPM)	Pounds Chlorine	Dosage Rate (PPM)
January	97.694	1320.75	1.35	496.75	0.51
February	90.122	1260.50	1.40	419.50	0.47
March	104.348	1398.50	1.34	464.50	0.44
April	106.659	1606.25	1.51	535.75	0.50
May	132.713	2507.00	1.89	828.00	0.62
June	176.671	4389.50	2.48	1464.50	0.83
July	182.407	5829.50	3.20	1931.00	1.06
August	171.741	3720.50	2.17	1268.00	0.74
September	160.514	3303.75	2.06	1096.25	0.68
October	111.081	1981.85	1.78	670.00	0.60
November	103.948	1585.75	1.52	539.75	0.52
December	101.150	1411.50	1.40	471.50	0.47
Total	1539.048	30315.35	-	10185.50	-
Average	128.254	2526.28	1.97	848.79	0.66

COMMENTS

During 1965, an average dosage of 1.97 ppm of chlorine was used in prechlorination to maintain residual of 0.15 ppm. An average dosage of 0.66 ppm of chlorine was used in post-chlorination to maintain a residual of 0.5 ppm in the treated water pumped to the distribution system. A total of 40,500 pounds of chlorine were used.

CONCLUSIONS

During 1965, demands on the plant equalled capacity over periods from 3 to 10 days. Demands over shorter or longer periods were not as critical. The high demands on the plant occurred during 1965 in spite of a relatively favourable precipitation pattern during the growing season. It now appears that irregardless of field irrigation, the annual increase in demand in the area will create periodic overloading of the plant within the next two years. Irrigation of field crops remains a very serious problem which will be difficult to resolve.

RECOMMENDATIONS

It is recommended that in spite of past dis[illegible] be continued in an effort to place the Unic[illegible] ministrative and financial base, which wo[illegible] in an equitable and reasonable manner.

ONTARIO WATER RESOURCES COMMISSION